

BMJ Open Qualitative, multimethod study of behavioural and attitudinal responses to cochlear implantation from the patient and healthcare professional perspective in Australia and the UK: study protocol

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ABSTRACT

Introduction The growing prevalence of adults with ‘severe or greater’ hearing loss globally is of great concern, with hearing loss leading to diminished communication, and impacting on an individual’s quality of life (QoL). Cochlear implants (CI) are a recommended device for people with severe or greater, sensorineural hearing loss, who obtain limited benefits from conventional hearing aids (HA), and through improved speech perception, CIs can improve the QoL of recipients. Despite this, utilisation of CIs is low.

Methods and analysis This qualitative, multiphase and multimethod dual-site study (Australia and the UK) explores patients’ and healthcare professionals’ behaviours and attitudes to cochlear implantation. Participants include general practitioners, audiologists and older adults with severe or greater hearing loss, who are HA users, CI users and CI candidates. Using purposive time frame sampling, participants will be recruited to take part in focus groups or individual interviews, and will each complete a demographic questionnaire and a qualitative proforma. The study aims to conduct 147 data capture events across a sample of 49 participants, or until data saturation occurs. Schema and thematic analysis with extensive group work will be used to analyse data alongside reporting of demographic and participant characteristics.

Ethics and dissemination Ethics approval for this study was granted by Macquarie University (HREC: 5201700539), and the study will abide by Australian National Health and Medical Research Council ethical guidelines. Study findings will be published through peer-reviewed journal articles, and disseminated through public and academic conference presentations, participant information sheets and a funders’ final report.

INTRODUCTION

Prevalence of hearing loss

In 2006, hearing loss was ranked as the third highest cause of years lived with disability by the WHO.¹ Hearing loss is strongly age related, and can lead people to experience diminished

Strengths and limitations of this study

- The qualitative data, as well as survey responses, will be triangulated to corroborate and validate the findings, and ensure accurate and consistent reporting.
- Schema and thematic analysis will enhance the credibility of outputs through consensus building during group work activities.
- The qualitative study is built on a small-scale sampling technique, which, while normal practice in qualitative health research, suggests limited generalisability.
- This is an initial proof-of-concept study; however, findings will be applied to a wider population-based research study conducted in both Australian and UK contexts for global appeal.

communication, frustration and a sense of social isolation.² Degrees of hearing loss are typically defined by an average of pure tone hearing thresholds (measured in decibels, dB, as the minimum level of sound needed to be perceived) across different frequencies in the better ear.³

The global prevalence of severe or greater hearing loss (≥ 65 dB) among people aged 15 years or older is 1.2% for men and 1.0% for women.⁴ It is estimated that 74% of the world’s population of 7550 million people is aged over 15 years (equating to approximately 5.6 billion people),⁵ which suggests that over 60 million people globally have severe or greater than severe (known from hereon in as ‘severe or greater’) hearing loss. These prevalence estimates, however, are based on studies conducted between 1973 and 2010, and given the shift towards an ageing population,⁶ they may be an under-representation of current prevalence.⁷ In 2005, approximately one in

five adults (3.5 million) in Australia had hearing loss,⁸ and 11% of these (400 488 adults) were estimated to have severe or greater hearing loss in at least one ear,⁸ with the frequency in Australian adults projected to exceed 573 000 by 2020.⁸

Hearing loss devices

Hearing aids (HA) are commonly recommended for adults with hearing loss. These are electronic devices placed in the outer ear that selectively amplify different frequencies in a compressive non-linear manner, reproducing the activity of cochlear outer hair cells. HAs rely on a sufficient number of remaining healthy hair cells in the cochlea (ie, the inner ear) to transduce the amplified acoustic signal into an electric signal that travels to the auditory centres in the brain via the auditory nerve. More damaged or non-functioning hair cells in the cochlea leads to greater magnitudes of hearing loss, further limiting the effective transduction of an amplified signal to the auditory nerve. As such, amplification does little to support people with more severe sensorineural hearing loss.⁹ For this group, a cochlear implant (CI) can be recommended to bypass damaged hair cells in the cochlea with a surgically implanted electrode array, and significantly restore the perception of sound. With CIs, speech and environmental sounds are captured by an externally worn speech processor, converted into an electric signal and transmitted to the electrode array in the cochlea, transducing the signal to the cochlear nerve.¹⁰

Benefits of CIs

The literature on hearing loss highlights how a large proportion of adults with postlingual sensorineural severe or greater hearing loss (ie, hearing loss caused by damage to hair cells in the cochlea, which has occurred after the development of language) benefit from CIs,^{11–13} including improved speech perception and enhanced quality of life (QoL).^{12 14–16}

Unless fluent in sign language and engaged in a deaf community, adequate hearing is a vital element of social and emotional well-being, self-efficacy and connectedness,¹⁷ and important for occupational well-being.¹⁸ There is a clear association between hearing loss and dementia¹⁹ and depression,^{20 21} reinforcing the importance of ensuring people are provided with timely access to appropriate resources. In addition to improving listening abilities and QoL, CIs are a cost-effective intervention, with a cost utility of nearly US\$10 000 per quality-adjusted life year.²² This takes into account direct costs (eg, the cost of the device) and indirect costs (eg, the cost for loss of wages or productivity).^{22 23} Despite these factors, utilisation of CIs globally remains low among the adult population.²⁴

Utilisation of CIs

Prevalence of severe or greater hearing loss and CI utilisation rates are not well documented. It is important to note that when comparing data from different countries,

some literature focuses on the adult population, some on the child population and some on a mixture of the two, while the age and the severity of hearing loss criteria listed for adults can also vary. In the USA, in 2009, it was estimated that 1.2 million adults and children with severe to profound hearing loss were eligible for a CI, but less than 6% had obtained one, while it was estimated that 90% of this population used HAs.²⁵ In the UK in 2009, approximately 613 000 adults were estimated to have severe to profound hearing loss, including 3% and 8% of adults over 50 and 70 years, respectively, many of whom may benefit from a CI.²⁶ Although the annual number of CI surgeries in the UK's adult population is gradually increasing, between April 2016 and March 2017, there were 919 CIs implanted in adults unilaterally, bilaterally simultaneously and bilaterally sequentially.²⁷ This indicates low utilisation rates in adults, particularly when compared with the child population, where, in 2011, 94% of eligible children (aged 16 years or under) used CIs²⁸ as a result of the universal newborn hearing screening programme.²⁸

In Australia in 2006, 87 634 people aged 15 years and over were estimated to have at least severe hearing loss in their better ear.⁸ In 2014, Cochlear, one of several CI manufacturers in Australia, estimated the number of CI devices implanted in Australia in children and adults to be 10 370²⁹; however, this figure is likely an under-representation of the total number of CI devices implanted as it may not include CI devices produced by other manufacturers. In 2014–2015 (financial year), 1498 CI procedures took place in Australia in both children and adults,³⁰ an increase in the annual number of CI surgeries since 2011–2012 of 1177.³¹ While it has been estimated that less than 10% of those eligible for a CI have received the device,⁸ the exact CI utilisation rate is unknown. In particular, CI candidacy guidelines in Australia currently rely on speech recognition ability while using HAs, and not on the severity of hearing loss as defined by hearing thresholds.⁹ No prevalence data are available where the hearing loss was defined in terms of hearing (dis)ability instead of hearing thresholds. With these discrepancies of reporting, further research could help determine current utilisation rates in the adult Australian population.

Healthcare professional perspectives

While research regarding the reasons for the low rates of CI utilisation (10% or less) globally is limited,²⁴ suggestions include: a lack of awareness about the benefits of CIs in the general population; healthcare professionals' limited knowledge of CI candidacy criteria; and low referral rates to specialist hearing services.^{32 33} Audiologists have been found to be positive in their attitudes towards the benefits of CIs for adults with postlingual deafness, yet some healthcare professionals are hesitant about the benefits for older adults.^{29 34} This may stem from assumptions that rehabilitation will be hindered by age-related cognitive decline and the deterioration of the auditory pathway, as well as concerns about the risks

associated with general anaesthesia in the older adult population.³⁴ Concerns persist, despite the fact that US studies have shown that CIs are effective in the older adult population (60 years or older),³⁵ and that benefits for this age group are not significantly different from benefits in younger age groups.^{35 36}

Healthcare professionals' levels of training, knowledge, experience and their relationship with CI programmes, as well as uncertainty about which patients are appropriate CI candidates, and when and how to make a referral to a CI service centre, are also said to determine referral behaviour and contribute to low CI utilisation.^{29 32} Education programmes for healthcare professionals about the benefits of CIs, with the provision of information about candidacy criteria, have shown potential in increasing referral rates,^{24 33} but have yet to be fully established at national levels.

Reported barriers to utilisation of hearing devices and rehabilitation in adults over the age of 50 years

Studies from the UK, Australia and the USA have reported that some adults over the age of 50 with hearing loss delay seeking assistance from a healthcare professional³⁷ because they are: (A) in denial about the severity of their hearing loss,³⁸ (B) concerned about the perceived inconvenience of accessing hearing rehabilitation³⁹ and (C) worried about the cost of a hearing device and its ongoing maintenance.³⁹ There are also indications that older adults with hearing loss often associate hearing technologies, such as HAs and CIs, with the stigma of ageism, or disability,^{39–41} while competing comorbidities are identified as a barrier to accessing hearing rehabilitation, as other healthcare conditions take priority.^{32 38 42}

Despite these reported barriers to healthcare utilisation, more targeted research is needed to clarify how CIs are perceived, both in the adult population utilising CIs and in the adult population with severe or greater hearing loss who are not yet utilising CIs. In addition, research is required to determine how access to services is discussed between patients and healthcare providers, including general practitioners (GP) (who refer patients to hearing support services) and HA audiologists (referred to here as 'audiologists'), and how discussions affect the decisions made and patient pathways taken through healthcare systems. It is important to note that the current CI candidacy criteria differ across countries. Furthermore, there is scant literature on healthcare providers': (A) perceptions of the advantages and disadvantages of CIs, (B) knowledge of CI candidacy and (C) views about facilitators and barriers to CIs, to inform research for service improvement⁹ and create more equitable care provision. This current gap in the literature warrants further attention, to better understand the barriers and facilitators, in order to enable a greater proportion of individuals who would benefit from CIs to gain access to these devices, in order to enhance their QoL.

METHODS AND ANALYSIS

Study design

We propose a qualitative, multiphase, multimethod (in this case more than one qualitative method) and dual-site study, undertaken concurrently in Australia and the UK to explore patients' and healthcare professionals' behaviours and attitudes to cochlear implantation. The study design is based on the Consolidated Criteria for Reporting Qualitative Research.⁴³ This 1-year study will run from June 2017 to June 2018.

Study context

In Australia, HAs and unilateral CIs are available with public funding through the Australian Government Hearing Services Program, State Government funding and the Department of Veterans' Affairs; for people who meet the eligibility criteria. The number of CIs that are publicly funded each year is limited, and varies state by state, resulting in waiting lists.⁴⁴ Private health insurance funds can be used to reimburse implantation of the second ear.^{23 45}

In the UK, HAs are available through the publicly funded National Health Service (NHS) or are available from private dispensers via self-funding or private health insurance. Unilateral CIs are available through the NHS for adults who meet the eligibility criteria specified by the National Institute for Health and Care Excellence.²⁶ Alternatively, CIs may be self-funded or available through private health insurance plans.⁴⁶

Study objectives

In order to explore the behaviours and attitudes to cochlear implantation from the healthcare professional and patient perspectives, the study objectives are to: (A) determine perceptions of barriers and facilitators associated with cochlear implantation in adults aged 50 years and older, with a postlingual and severe or greater sensorineural hearing loss; (B) assess patients' and healthcare professionals' behaviours and attitudes to cochlear implantation; and (C) clarify how attitudes and behaviours impact on patient pathways through healthcare services.

Research team

The research team is made up of researchers with varying levels of experience conducting qualitative research within the audiology field. The lead data collection researcher MB (Research Officer, MPH) has experience conducting qualitative and quantitative health research and has been trained in focus group facilitation and interviews. She does not work within the field of hearing healthcare, removing potential researcher bias during data collection. The co-researchers include FR (Professor, PhD), who is a significantly experienced qualitative researcher, JB (Professor, PhD), an extensively experienced implementation science researcher, CM (Professor, PhD) and IB (Research Fellow, PhD), who are considerably experienced audiologists and audiology researchers, AL (Senior

Research Fellow, PhD), an experienced consumer informatics researcher, and SH (Speech and Language Therapist, PhD candidate), who has experience working and conducting qualitative research within the audiology field, and is trained in focus group facilitation. The participants will be provided with an information sheet detailing the purpose and aim of the study, as well as the contact details of the data collection researcher (MB) and study lead (FR).

Participants

The Australian participant cohort will include: (1) GPs; (2) audiologists; and (3) adults over the age of 50 with bilateral (both ears) severe or greater postlingual hearing loss selected according to two classifications: (A) bilateral or unilateral CI users and (B) HA users or CI candidates (in the process of being assessed for a CI). The UK cohort will include audiologists only to provide a healthcare professional comparison group from an international perspective. The UK site will concentrate on audiologists' practices, behaviours and attitudes to ascertain the CI referral process, related patient pathways and care provision for the older adult population.

Participant inclusion criteria

Patient participants will be: 50 years or over; have bilateral severe or greater postlingual sensorineural hearing loss; be proficient in English; and be willing and able to engage in focus group discussions and complete a written demographic questionnaire and qualitative proforma (open-ended survey).

GPs and audiologists must be currently working in their field and have had experience consulting with the target populations. The study will aim to recruit healthcare professionals with a variety of experiences working within their field and with people with a hearing loss.

Recruitment

The study aims to conduct 147 data capture events across a sample of 49 participants, or until data saturation occurs⁴⁷

(table 1). In order to achieve these numbers, recruitment of GPs, audiologists and adults with severe or greater hearing loss will continue until February 2018 or until saturation is achieved. Promotional flyers for audiologists will be distributed to audiology clinics and hearing health conferences. Promotional flyers will be sent to GP clinics via professional network e-newsletters. Promotional flyers for adults with hearing loss will be distributed to hearing associations for display on their websites, placement in newsletters and placement on social media sites. Audiologists will also provide eligible clients with the promotional flyers. Flyers will include general study information and research team contact information. Using this approach minimises direct researcher contact with potential participants and reduces the possibility of researcher coercion in the recruitment process. Researchers will have no prior relationships with participants. Recruitment of audiologists, GPs and adults with hearing loss will be Australia-wide. Recruitment of audiologists in the UK will be UK-wide.

In this study, purposive time frame sampling^{48–50} will be employed to ensure a wide mix of participants. In the case of patients, purposive sampling means a mix of gender, socioeconomic class, age and ethnicity. In the case of professionals this means a mix of gender, service location (rural and metropolitan areas) and patient group served. Eligible study participants will be enrolled into each focus group in the order in which they respond to the promotional flyers and contact the research team. Time frame sampling encourages researchers to outline a predefined recruitment period thus ensuring eligible individuals have an equal opportunity of being enrolled during that time frame. This removes the possibility of recruitment becoming opportunistic,⁵¹ and while it is acknowledged that self-selection may introduce a degree of bias, it also ensures participants are willing to engage in the study and provide detailed information about their experiences.

Once individual eligibility is established, and informed consent given, participants will be allocated to a study

Table 1 Frequency of data capture events for the pilot and principal study per participant group

Participants (n=57)	P1* (n=11)	P2† (n=8)	GPs (n=8)	Aud‡ (n=11)	Aud UK§ (n=11)
Data capture event					
Pilot focus groups/interviews	3	–	–	3	3
Pilot demographic questionnaire	3	–	–	3	3
Pilot qualitative proforma	3	–	–	3	3
Principal focus groups/interviews	8	8	8	8	8
Principal study demographic questionnaire	8	8	8	8	8
Principal study qualitative proforma	8	8	8	8	8
Total	33	24	24	33	33

*P1: Cochlear implant user.

†P2: HA user and cochlear implant candidate.

‡Aud: HA audiologist in Australia.

§Aud UK: HA audiologist in the UK.

GP, general practitioner; HA, hearing aid.

focus group, until each of the six planned focus groups have reached maximum capacity (10 participants, 20% above the required participant number (n=8)). Overestimating participant recruitment will ensure that sample saturation can be achieved, with a well-recognised attrition rate of 20% for focus group attendance.⁵² The sample size has been determined according to the literature on optimal focus group numbers for full participation. The sample size will also encourage participants to voice their opinions freely.^{53–55}

Three audiologists and three CI users will be invited to participate in two separate pilot focus groups in Australia, and three audiologists will be invited to participate in a focus group in the UK. The questions, questionnaires and proformas will be similar across the patient cohorts and similar across the healthcare professional cohorts. The pilot focus groups and pilot interviews will test the acceptability, timeliness and comprehensiveness of the questions, and ensure the methodology complements the study's aims and objectives. The same recruitment, data collection and analysis methods used for the principal study will be used for the pilot study.

Forty principal study participants and nine pilot study participants will be enrolled across Australian and UK sites to enable a comprehensive exploration of the subject matter. This sample is entirely appropriate for a qualitative study⁵⁴ aimed at eliciting in-depth, rich and 'thick' descriptions of 'lived experience',⁵⁶ and lends itself to work with different population groups.

Data collection

The 1-year study is supported by two stages of data collection (figure 1).

Stage 1

Stage 1: Literature review, pilot and principal study focus groups and interviews, as well as the completion of demographic questionnaires.

Literature review

Stage 1 commences with a literature review of the current research around barriers and facilitators to CI use, associated health service provision and patient pathways through healthcare systems. The results will inform the development of the focus group questions and demographic questionnaire.

Focus groups

Two pilot focus groups will be conducted in Australia with audiologists and CI users, one pilot focus group will be conducted in the UK with audiologists, and five principal study focus groups (four in Australia with CI users, HA users and CI candidates, GPs, audiologists; and one in the UK with audiologists) will be conducted during stage 1.

The focus groups with adults with hearing loss will cover questions regarding:

- ▶ Hearing and QoL.
- ▶ Information and support received.
- ▶ Hearing devices used.
- ▶ Motivators and facilitators to using CIs.

Focus groups with healthcare professionals will include questions regarding:

- ▶ Knowledge about CIs and candidacy criteria.
- ▶ Experience of discussing hearing loss and CIs with patients.
- ▶ Perception of CIs and how they impact patients.
- ▶ Types of support needed to discuss hearing loss with patients.

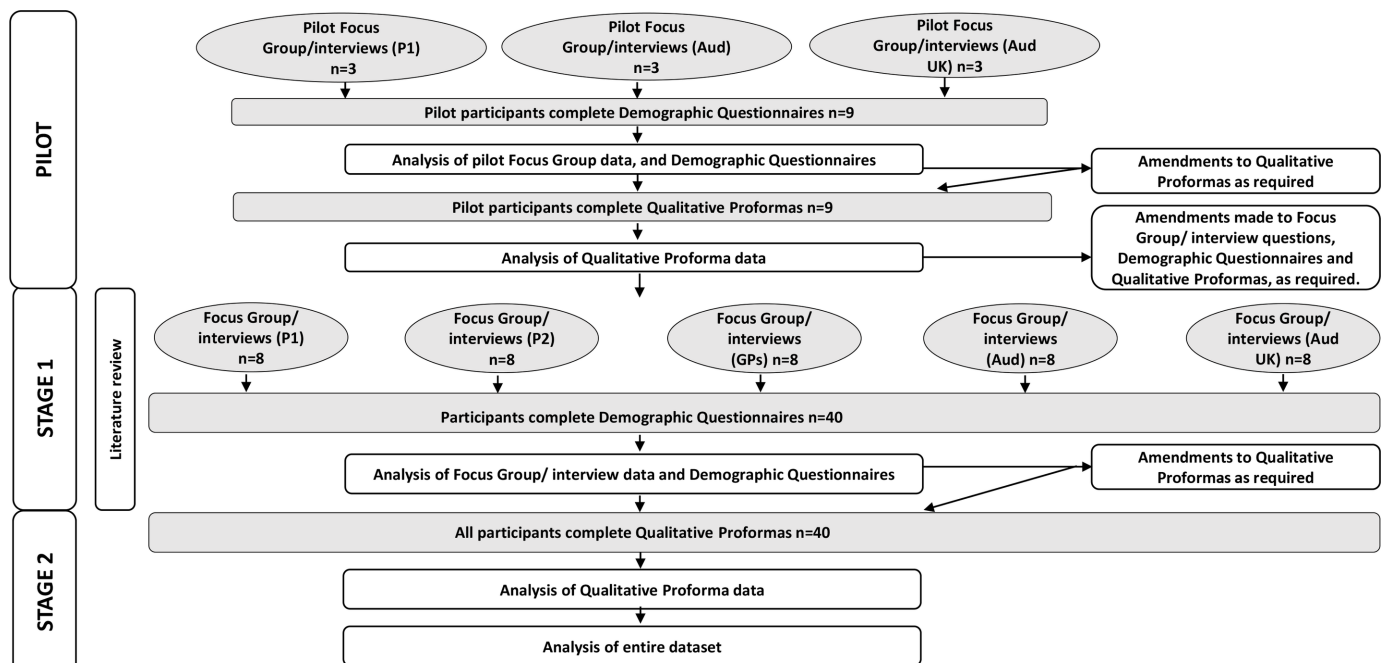


Figure 1 Study plan. GP, general practitioner.

- ▶ Shared care with hearing services and hearing specialists.

The study researcher (MB) will facilitate the Australian focus groups in a meeting space within the university, with an observer present (noting group dynamics, body language and gestures, and managing audio recording equipment).^{53 57} The UK chief investigator (SH) will conduct the UK audiologist focus group/interviews in meeting spaces at participants' workplaces, community halls, or in meeting rooms at the local health board, as well as via Skype if required, and will follow the same methods to those used in Australia to ensure consistency.

Each focus group will be approximately an hour in length and will be audio-recorded. During focus groups, participants will be arranged around a table, so they can see each other's faces. Participants will be provided with a copy of the 'Rules of Engagement' before focus groups commence, which advise that participants should respect each other's opinions, be willing to listen to others and to speak in turn.⁵³ Participants will also be sent the focus group questions ahead of time, to assist with understanding during the live group events. In addition, communication support in the form of either remote, live, real-time captioning by a stenographer,⁵⁸ a wireless assistive hearing device system, or an *Auslan* (Australian Sign Language) interpreter⁵⁹ will be available if required. Provision of such support is considered best practice when running focus groups with people who have hearing loss to enable conversations to be accessible and comprehensible for all participants.⁵⁸ Participants will be reminded that focus groups will be recorded unless objections are voiced, in which case written notes alone will be taken. Transcriptions will include pseudonyms to minimise the possibility of any participant being identified,⁵⁷ and participants will be advised of preparations for data confidentiality and personal anonymity.

All participants will be offered a stipend as a gesture of appreciation for their time and refreshments will be provided.

Interviews

Eligible participants unable to attend a focus group but keen to participate will be interviewed by phone, via Skype or email, depending on their preference. The videoconferencing option on Skype enables participants to see the speaker, to lip-read and see facial gestures. Focus group questions will be sent out in advance and used as interview questions. Participants will also receive a consent form and demographic questionnaire to be completed before the phone interview, Skype interview or email communication takes place. All interviews will be audio-recorded and transcribed.

Demographic questionnaires

Following focus groups and interviews (irrespective of data capture method), participants will be asked to complete a demographic questionnaire designed to provide contextual information about individual service

provision or receipt (see online supplementary file). Two questionnaires will be produced; one for healthcare professionals and one for patients, with multiple-choice, open-ended questions.

The Patient Demographic Questionnaire will include questions about the participant's gender, age, health insurance status, home postcode, comorbidities, hearing loss, hearing device use and information acquisition experiences.

The Healthcare Professional Demographic Questionnaire will include questions about the professional's gender, age, occupation, workplace, work postcode, years of practice, public or private healthcare service provider status, frequency of working with patients with hearing loss and information provision experience.

Analysis of stage 1 data

Focus group, interview and demographic questionnaire data will be analysed to inform the development of stage 2. All audio recordings of focus groups and interviews will be transcribed as they are completed, along with field notes, to ensure the team's early immersion in data. Analysis will be conducted continuously, and results built on iteratively, while data are being collected. This way, any changes to the data collection tools in phase 2 that may be necessary can be undertaken early on during the study. By starting analysis as data are collected we will comply with an inductive approach to data analysis,⁶⁰ be better informed and able to facilitate clearer dialogue during the focus groups and the interviews.

Qualitative schema analysis and thematic analysis techniques will be used,⁶¹ which are common methods for the analysis of focus group and interview transcripts, where extensive data contain multiple voices (figure 2). Schema analysis allows team members to create individual and group overviews of texts, while at the same time revealing essential textual elements, derived in a summarised form, to highlight key notions or concepts embedded in texts. Schema analysis lends itself to a group working approach and helps validate findings through consensus building activities, where critical findings are discussed and agreed upon by the group.⁶¹⁻⁶³ Group work analysis will include the study team: authors MB, FR, CM, IB, SH and AL. UK-based researcher, SH, will participate in all Australian-based team work discussions via Skype or email. In addition, the UK researcher will be in regular contact with the Australian project officer (MB) to ensure data collection is conducted in the same way across the two sites. Demographic questionnaire data will be analysed using descriptive statistical techniques.⁶⁴ Demographic data will be described to provide context about the participants.

The UK data will be analysed using the same methods as the Australian data. Any similarities and differences between the two cohorts will be highlighted, and comparisons about service provision will be made between the audiologist data from the two sites. The UK sample will offer rich comparative healthcare provider detail, and insights into differences between services in both sites.

The authors will compare audiologists' perceptions, and experiences across the sites, with plans to include other stakeholder groups in a follow-on study, to provide more comparative detail.

Stage 1 data will elicit information about, but not restricted to: support for cochlear implantation; the process of CI candidacy; consultation and negotiation; types of information provision; professional practices; misconceptions and misunderstandings; effects of HAs and CIs on QoL; daily routines and relationships; concerns, fears and anxieties; patient pathways through healthcare systems; patient and professional information needs; and long-term aspirations for hearing health.

Stage 2

Stage 2: Development of the qualitative proformas will be informed by stage 1 analysis and the results of the literature review. Stage 2 is designed to build understanding, investigate data inconsistency and expand findings, while corroborating earlier data sets.

Qualitative proformas (open-ended surveys)

Each participant will be sent a qualitative proforma to complete (see online supplementary file). Qualitative proformas are brief, open-ended surveys containing limited choice questions (approximately four to six), for participants to qualify their responses from other data capture events. In this study, qualitative proformas will be designed through team discussion, and personalised for each principal focus group cohort.

Qualitative proformas will include questions about:

- ▶ Information provision/receipt about CIs.
- ▶ Shared decision-making about hearing health.

Analysis of qualitative proformas

Qualitative proformas will be analysed using thematic analysis techniques⁶⁵ to disclose key themes and their concomitant categories. Individual and group qualitative proforma analysis will lead to the development of a thematic analytic framework. Comparisons will be drawn between the UK and Australian audiologists' proformas to highlight differences in referral pathways and knowledge about CIs between the two sites. Thematic analysis teamwork will require all team members to contribute to, and agree on the final thematic frameworks, sharing decisions about key issues arising.

Open coding will be conducted initially during data collection, to break down the data into discrete ideas, followed by axial coding which will help classify the discrete codes, and categories into broader themes, once data collection is complete.⁶⁶ NVivo Pro 11 software V.11, 2015, will be used to code the data, for the thematic analysis, to derive themes and categories, to enhance the rigour of the working methods and trustworthiness of results, through systematic and transparent coding of data.⁶⁷

Data from all study stages will be treated corroboratively, with each element informing the next, and leading to a comprehensive data triangulation (testing one source of data against other sources of data to

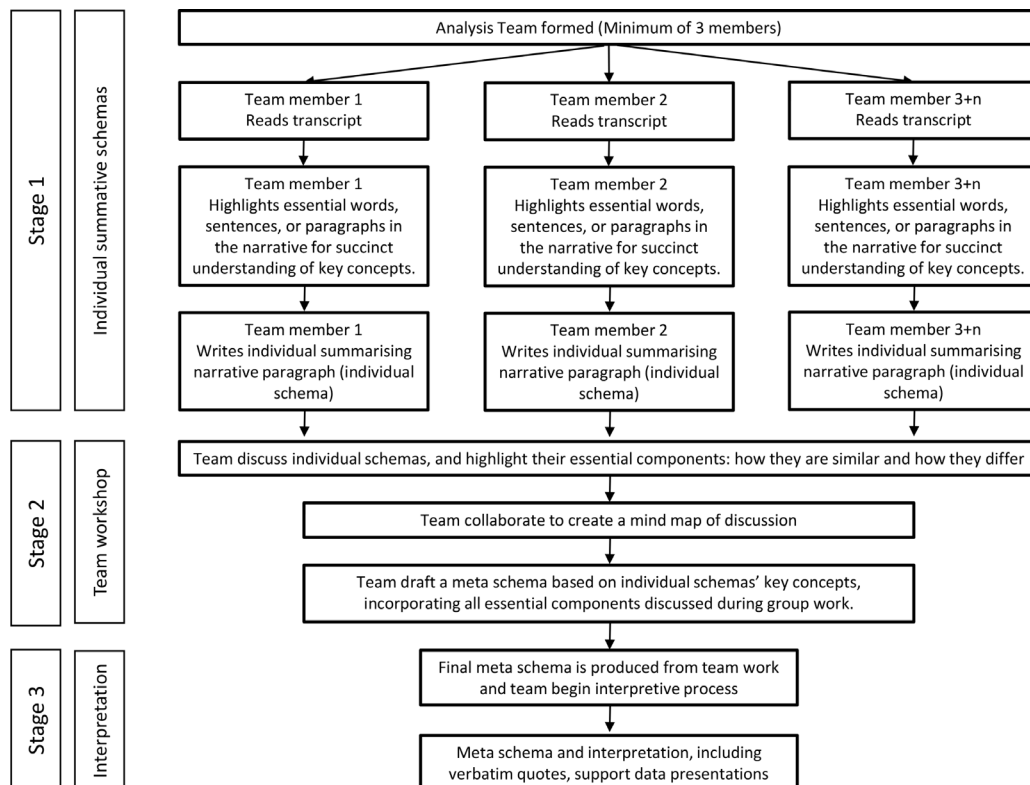


Figure 2 Simplified presentation of schema analysis, an in-depth teamwork analysis process (adapted from Rapport *et al* [63]).

cross-validate or explain discrepancies in sources),^{68–71} verifying results and strengthening the study's validity. The multimethod data collection and analysis techniques are designed to encourage nuanced and detailed understandings of the experiences of CI users, HA users and CI candidates, GPs and audiologists. The findings will be generated from the transcripts and proforma data using an inductive approach to data analysis. This refers to the way that theory 'emerges' from the data, which is dealt with 'from the ground up', with findings grounded in the raw material and meaning revealed iteratively. An inductive approach to data analysis in this study will enable researchers to develop a thematic framework based on the key themes and categories arising within the data.⁶⁰

Presentation of results

Results from the focus groups, interviews and proformas will be presented as themes and their concomitant categories, with verbatim quotations embedded in the narrative that describes the themes, to support and add authenticity to the research group's interpretations.

Enhancing the trustworthiness of the research

The rigour of data will be achieved by applying Lincoln and Guba's theory of trustworthiness to attain credibility, transferability, dependability and confirmability.⁷² The pilot phase of the study, where focus group questions, questionnaires and proformas are tested on a small sample of participants, adds to the trustworthiness of the data, as it will validate whether the tools accurately measure and collect the information as intended.⁷⁰

The use of data triangulation, multiple methods of data collection, across multiple cohorts with differing perspectives, as well as using multiple researchers to code the data will ensure credibility of findings, and make sure that the findings represent the attitudes of the participants, and are not biased by the researcher. The sample of participants will be diverse and encompass healthcare professionals from a range of settings and experiences, as well as patients from a range of age groups, experiences and locations. This will provide data representing the diverse views of the participants, leading to findings that will be generalisable. Recruitment, data collection, data analysis and results will be described in 'thick' detail, providing opportunity for the research to be replicated by other researchers, ensuring dependability.

Multiple researchers from the team will code the data, and validate the analytic framework to ensure the interpretation of data is not biased by a single researcher's perspective, but grounded by the contents of the data.⁷³ These group working methods will ensure that the narrative summaries derived from the thematic frameworks are valid and trustworthy according to the whole team's views.

Patient and public involvement

There is a gap in the literature regarding the patient and healthcare professional perspective on barriers and facilitators to cochlear implantation. While there is

abundant evidence regarding the experience of adults with hearing loss and HAs, there is little that specifically addresses the complex decision-making around CIs. The research question and outcome measures were developed through consultation with research team members who are audiologists and speech therapists, who ensured the study question was relevant given their experience in hearing health, and to ensure the outcome measures were appropriate. They also acted as representatives of the healthcare professional cohort, providing feedback about their experiences as professionals, and guiding the development of the study. Pilot focus groups and interviews were also conducted with patients and healthcare professionals to ensure the patient perspective was embedded from the outset and that assessment tools were acceptable and gathered appropriate data. All results will be disseminated to study participants upon completion of the project through information sheets and an executive summary. These documents will also be distributed to hearing associations, and participating GP and audiology clinics.

ETHICS AND DISSEMINATION

Ethical approval for the study has been granted by the Macquarie University Human Research Ethics Committee (HREC) (approval number 5201700539). All data collection will be conducted in accordance with the National Health and Medical Research Council ethical guidelines,⁷⁴ and will adhere to the principles of the Macquarie University Human Research Ethics Committee. All participants will provide informed consent before participating. Participation will be voluntary, and participants will be able to withdraw at any time with no risks anticipated. If undue distress is caused by any aspect of this study, an appropriate healthcare professional or researcher will respond to the needs of the participant, with counselling services available if necessary.

Data storage and protection

All study materials will be deidentified and data will be stored on password-protected computers, in locked filing cabinets and locked offices on university premises, separate from participant identifiers. All data will be destroyed 7 years after completion of the study, in accordance with standard ethical guidelines. All anonymised UK and Australian data will be shared via secure password-protected online university storage, and security and anonymity of data will be upheld.

Dissemination

Findings will be reported to the funders and disseminated widely through international, peer-reviewed, open-access journal publications, public and academic presentations, oral and poster presentations at scientific conferences and a service user group information sheet.

SIGNIFICANCE AND IMPACT OF THE STUDY

This will be the first Australian study to reveal, using a range of innovative methods, behavioural and attitudinal aspects of hearing service provision for older adult HA and CI users compared with a UK service example. The study will disclose a wide range of public and professional perspectives on hearing loss and views on barriers and facilitators to cochlear implantation in complex health-care systems. It will be underpinned by a comprehensive overview of the international literature on the topic and indicate motivators and demotivators to service provision for prospective CI users.

Individual patients may find the process of self-reflection validating, while sharing insights with others in a similar situation may establish a supportive community. Healthcare professionals and patients will mutually benefit from clearer information on hearing health. At the end of the study, all participants will receive a summary information sheet, and links to useful sources of information. The process may assist healthcare professionals in understanding more about the patient experience, and how to move patients effectively through CI candidacy channels to better support their needs.

This study will lead to data that is representative of both healthcare professional and patient perspectives, illuminating current hearing health pathways in Australia and the UK, highlighting gaps in current services and raising awareness of CI users' needs. This will be the first stage in developing a longitudinal, pan-Australian study, with an international arm, leading to implementable outcomes to increase public awareness of hearing loss and enhance consumer support, while offering healthcare professionals clear referral guidelines.

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